Appendix A

ILC Business Case

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EXECUTIVE SUMMARY

Overview

There are numerous opportunities for improving inventory management and maintenance processes in the Marine Corps by applying best practices from today's leading commercial companies. The ILC Team identified a one time **$561M-$736M** of potential reductions in inventory and maintenance & supply expenditures that can be reinvested to improve warfighting capabilities. Inventory levels of $1.2B, for certain classes of material (primarily Class IX), represents three years of annual budgeted expenditures and could be reduced by $549M - $706M. Annual carrying costs for these inventories could be reduced by $125M. Relayering and eliminating maintenance processes would result in the restructuring of 2,589 maintenance and supply billets that convert to $62M. Additionally, shifting the initial issue spares burden to vendors would potentially reduce expenditures by $12M-$30M.

Inventory levels are too high ⟶ ***$549 M - $706M (45%-60%)***

- ***Today's inventory levels support 3 years of annual budgeted expenditures***
- ***Commonly available material need not be stocked but purchased when needed***
- ***Safety stock and order ship times should be measured in hours instead of days and weeks***
- ***Carrying costs are being incurred for excess inventory***

During the 12 weeks of the ILC Initiative the business case workgroup experienced extreme difficulty in obtaining the necessary data. The current information systems are inadequate and do not provide the information necessary to effectively manage materiel and logistics processes. Investments in information systems have to be made for the ILC Initiative recommendations to succeed. Commercial companies that invest in information and business processes reap huge rewards. IBM gained a 4:1 return by investing $2.7 billion that resulted in $10 billion of operational improvements

Background

The Marine Corps generally manages materiel at the class of supply level without regard to its end item application or original use requirement. The commercial best practice is to focus on the end item requirements and manage the individual parts accordingly. Requisition-to-order receipt cycle times in the Marine Corps is measured in days and weeks, while best-in-class commercial companies use hours as its measure of success. The Marine Corps uses one supply chain to manage all its materiel while commercial best practice is to develop separate supply chains based on criticality of need. Applying inventory management practices from commercial best-in-class companies can

dramatically improve the service levels for the warfighter while at the same time providing additional funds, through inventory draw-down, to reinvest in other warfighter support activities.

There is a large gap when comparing Marine Corps practices to commercial best practices

- ***Marine Corps focuses on part level while commercial best practice is to focus on end item need requirements***
- ***Marine Corps order-to-receipt time is measured in days and weeks when commercial best practice is measured in hours***
- ***Marine Corps used on supply chain while commercial best practice develops separate supply chain based upon criticality of need.***

"We are finding it increasingly difficult to strike a delicate balance between maintaining current readiness and investing in modernization. One thing is certain. We will always focus on current readiness."
Source: General Krulak congressional testimony in September 1998

Commercial companies invested heavily in inventories in the 1960-80's period due to lengthy order processing cycles, vendor lead times, and order shipment times. The management processes to support these large inventories were cumbersome and the individual supporting activities were functionally oriented in stove-piped organizations that lost sight of true customer needs. The results were "iron mountain" inventories that provided a safety blanket for using organizations in case of disruptions in the supply chain. The Marine Corps is still using an "iron mountain" philosophy to manage materiel. Today, these same companies that previously invested heavily in inventories instead invest in information technology, vendor relationships, distribution partnerships, business process improvements, and improving the behaviors, skills and capabilities of their workforce. The result has been improved customer service while at the same time dramatically reducing investments in inventories.

Major Findings

Non-Recurring

- ***Inventory rightsizing would potentially reduce inventory by $561M-736M***

Recurring

- ***Carrying cost reduction equal to $125M per year***
- ***Reallocation of layered maintenance and supply overhead will result in benefit of $62M***
- ***Repair Cycle Times can be reduced by 35%***

The ILC Team identified a set of initiatives that stem from concepts learned during the Penn State University Best Practices Seminar phase of the ILC Initiative. Recognizing that an up-front investment is required, together these initiatives can potentially avoid **$561M-$736M** of non-recurring costs over a 2–5 year period. The major initiative centered around inventory management can potentially yield a one-time $553M - $714M of non-recurring inventory and

$125M of annual recurring costs over a 2-5 year period. Maintenance initiatives can potentially reduce maintenance costs by $62M of recurring costs and improve repair cycle time by 35%. These future costs can then be reinvested to increase the warfighting capabilities of the Marine Corps.

- ***Inventory profiled is $1.189B; Budgeted Expenditure=$347M; Inventory Turns = 0.3***
- ***Existing information systems are inadequate to effectively provide meaningful information to manage logistics process***
  - ***Data calls and manual analysis were used to obtain inventory data after 6 week effort of trying to use existing information systems***

The inventory profile evaluated for the ILC Initiative totaled $1.189B. It represents Marine Corps owned materiel, where the Marine Corps is the PICA I (Primary Inventory Control Activity) and SICA (Secondary Inventory Control Activity) for all classes of supply except Classes V, VI, and VII. An inordinate amount of time was necessary to collect the inventory data. Marine Corps logistics systems do not provide readily interpreted data at the enterprise level, and therefore numerous data calls, coupled with personal phone calls, were required over a six-week period. Additionally, other areas analyzed for this business case experienced the same degree of difficulty in obtaining data. More time and completeness of data would have been preferred to perform a more complete business case. The analysis conducted, however, does pass the reasonability test when reviewed with other ILC Team members. This particular exercise validates the need for integrated and effective information systems that parallel commercial best-in-class companies.

Investments

Investments will have to be made to achieve the ILC Initiative recommendations and speed and time are two critical success factors. Legacy information systems have to be replaced with agile, open, and flexible systems. Systems must support the ability to see and influence the supply chain. People need to be trained, educated and re-skilled. Organizations need to be restructured from vertical silos to horizontally integrated mission focused support teams.

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Figure A-1 is a graphical representation of the relative investment and benefits of implementing the long term objectives of the ILC Initiative.

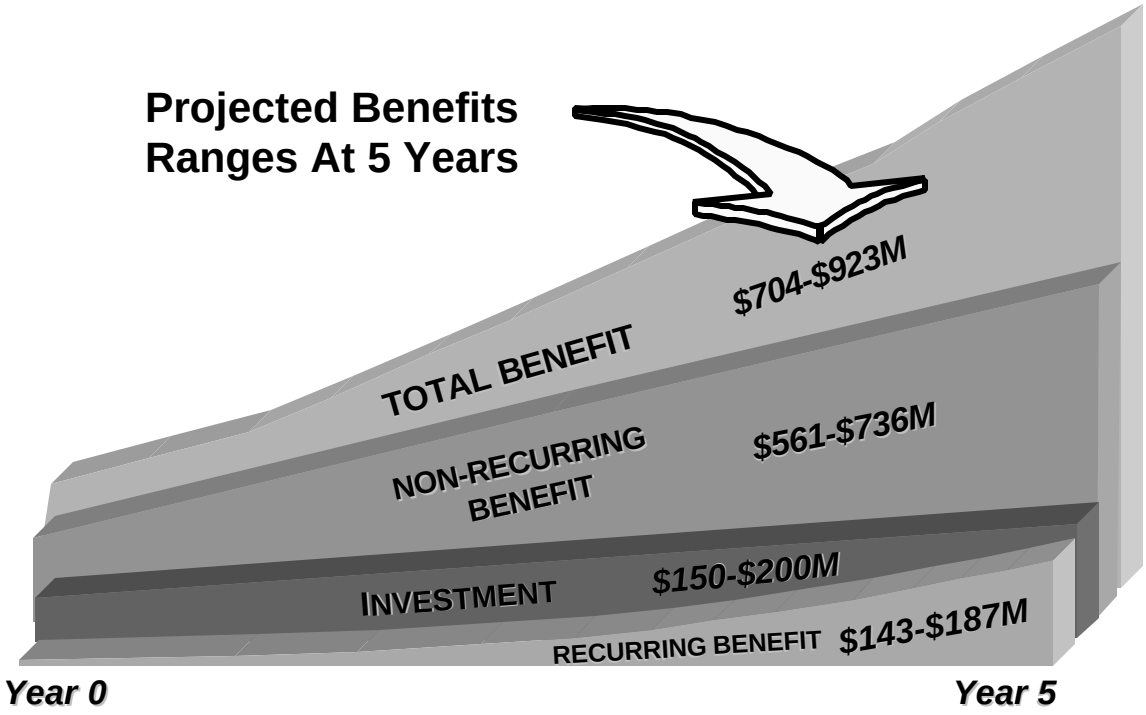

Figure A-1: Cumulative Benefit Profile

Summary Table of ILC Initiative Benefits

The initiatives and their financial impact are reflected in Figure A-2: Benefits Summary of ILC Initiative (see next page). A brief description of each initiative follows Figure A-2 to provide the reader summary information for each initiative.

Initiative Category	Specific Initiative	*Description*	Potential Operational Impact **Non Recurring** *(2-5 year period)*	**Recurring** *(per year)*
I. Inventory Management				
	Inventory Draw-down	Moving inventory ownership of routine and leveraged materiel to vendor	$348M-$417M (29%-35%)[1]	
	Requirements Determination Reduction	Reducing safety level and order ship time	$160M-$209M (13%-18%)[1]	
	IT and Business Process Improvements	Improving IT effectiveness and business processes	$41M-$80M (3%-7%)[1]	
	Reduction of Carrying Costs	Reducing carrying costs due to inventory draw-down[2]		$125M
Sub-Total Inventory Management			**$549M - $706M (45%-60%)[1]**	
II. Realigning and Consolidating Echelons of Maintenance		Moving 2nd Echelon to Intermediate level and 4th Echelon to Depot level		$62M[3]
IV. Provisioning		Shift initial issue spares burden to vendors	$12M-$30M	
V. Information Technology				
Totals for Quantifiable Benefits			**$561M-$736M**	**$187M**
Non Quantifiable Benefits				
III. Footprint / Deployability		Shift from inventory-based sustainment to distribution-based	20%-70% (stons)[4]	
Reducing Maintenance Repair Cycle Time		Reducing repair cycle time		35%[4]

Notes:

1. Percentage is based upon non-recurring savings divided by FY 98 baseline inventory analyzed ($1.189B)
2. Carrying costs are embedded in manpower, facilities, processes, disposal, turnover, information systems costs, and other infrastructure costs that support existing inventories disposal and turnover
3. This represents an order of magnitude value for restructuring opportunities
4. Data was unavailable in the time allotted to develop quantifiable dollars; stons = short tons

Figure A-2: Benefits Summary of ILC Initiative

I. Inventory Management Initiatives

- **Inventory Draw-down: *Moving Inventory Ownership of Routine and Leveraged Materiel to Vendor results in potential* $348M to $417M from the $1.189B baseline inventory analyzed**

The Quadrant Model is a major concept developed during the ILC Initiative and implies entirely new ways of managing materiel in the Marine Corps. A major assumption of the Quadrant Model is for vendors to own and manage certain materiel that is available from multiple vendors. Owning, storing, and managing routine materiel such as office supplies, nuts and bolts, and low-value consumables wastes Marine Corps capital resources and process time that could be more effectively applied elsewhere. Eliminating the need for the Marine Corps to own and store materials that are readily available from numerous vendors can potentially reduce Marine Corps inventory levels by $348M to $417M from the $1.189B baseline inventory analyzed.

Requirements Determination Reduction: *Reducing Safety Level and Order Ship Time*

- **Reducing safety stock and order ship time represents roughly $160M-$209M of wholesale and retail inventory 13-18% one-time inventory draw-down over a 2-5 year period.**

The area of requirements determination provides significant opportunity for the Marine Corps to draw-down inventory and avoid future costs for replenishing materiel. The ILC Business Case workgroup analyzed order ship times and safety levels and recommended more commercially accepted standards. If implemented, these recommendations could result in a projected 13-18% one-time inventory draw-down over a 2-5 year period. Corps wide, this draw-down represents roughly $160M-$209M of wholesale and retail inventory.

IT and Business Process Improvements: *Improving IT Effectiveness and Business Processes*

- **A conservative estimate of a 5-10% reduction of inventory is being estimated yielding an additional inventory reduction of $41-$80M.**

Study after study shows that information technology and effective improvements in business processes improve operational performance by orders of magnitude. The ILC Business Case workgroup has taken a conservative approach in estimating inventory improvements due to IT investments and improvements to business processes. Reductions in inventory due to shorter safety stock and order ship times, discussed in an earlier section, can not be achieved without process improvements and IT investments. Additional reductions, however, could be achieved through more effective procurement processes, vendor relationships, and asset visibility. Electronic commerce is an enabler to all three of these improvements. As a result, a conservative estimate of a 5-10% reduction of inventory could yield an additional inventory reduction of $41-$80M.

Reduction of Carrying Costs: *Carrying Cost Reduction Due to Inventory Draw-down*

- **A 15%-25% range estimate (25% being the commercial average) for carrying costs resulted in a potential $125M estimated yearly reduction as a result of inventory draw-down.**

Carrying costs represent the value associated with holding inventory. This includes space, manpower, equipment, etc. that is used to maintain the inventory on hand. Douglas Lambert's treatise on inventory carrying costs, acknowledged to be a standard used by industry today, concluded that carrying costs ranged from 14%-35% of on-hand inventory. It is general knowledge in the logistics community that 25 percent is a good average to use when computing carrying costs. The Business Case workgroup, as a result, agreed to use 15%-25% as the range, which resulted in a potential $125M estimated yearly reduction of carrying costs.

Alternate Proof For 45%-60% Business Case Inventory Draw-Down

- **A bottoms-up estimate for developing inventory levels validates business case analysis**

Inventory draw-down, requirements determination reduction, and IT and business process improvements previously discussed potentially could reduce inventory by $549M-$706M (45%-60%). To test the reasonability of this result, a bottoms-up inventory scenario was developed. To perform this analysis, it was assumed that zero-inventory exists and investments were required to support the FY 98 budgetary expenditure of $346M. Conservatively high assumptions were made for safety stock (90 days), operating level (90 days), order ship time (90 days), and war reserves (180 days). The analysis concluded that an inventory investment of approximately $400M was required, $800M lower than FY 98 inventory and exceeding the 45%-60% analysis in the Business Case.

II. Moving Echelon Maintenance: Moving 2nd Echelon to Intermediate level and 4th Echelon to Depot Level and Reduction of Repair Cycle Time

- **The transfer of responsibility for 2nd echelon maintenance to the Intermediate level, and 4th echelon maintenance to the Depot level will improve repair cycle time by 35% customer service and reduce maintenance costs by $62M.**

The transfer of responsibility for 2nd echelon maintenance to the Intermediate level, and 4th echelon maintenance to the Depot level will improve repair cycle time by 35% customer service and reduce maintenance costs by $62M. These maintenance savings represent average salaries of 2584 T/O billets that will be available for restructuring.

III. Footprint/Deployability

- **A 20-70% reduction of footprint is projected in this analysis.**

A further opportunity area for the ILC Business Case is in MAGTF deployment "footprint" and deployability, including benefits through changes to a distribution based logistics support concept, managing inventory using the Quadrant Model approach, and moving selected intermediate echelon maintenance activities for secondary reparables to depot maintenance. The benefits of ILC Initiative implementation actions translate to a smaller deployment footprint, making the MAGTF a more responsive and lucrative force-of-choice for our supported CINCs. Up to 70% reduction of footprint is projected in this analysis. Time did not permit the detailed analysis to determine the dollar savings. However, the current War Reserve System Posture Report indicates that the Total War Reserve Requirement is $2B, and is estimated at nearly twice the lift footprint of a MEF.

IV. Provisioning

- **Because of disconnected provisioning and stockage practices, we may be disposing of over half (and up to 90%) of our initial spares investments within the first three to four years of an item's life cycle, then re-procuring those same items later as end-items enter the "wear-out" phase. The dollar impact is between $ 12M and $30M annually (in PMC dollars).**

An opportunity area that was examined at a high level was Initial Provisioning. At an "enterprise level" view of Marine Corps practices, there are potential gains at closely examining and revising our Initial Issue Provisioning practices. Ideally, we should strive to have vendors assume the risk and provide spares for the initial "infant mortality" phase of an equipment's lifecycle, and help develop "true" usage data for demand-based requisitioning objectives. After sufficient usage data on fielded equipment is captured, the Marine Corps should then buy an appropriate level of spares as lifecycle production rates permit. We recommend this as a target area for the newly established PM/WSEM teams at MATCOM.

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BENEFITS

Inventory Draw-down

The ILC Team identified three ways to improve inventory management through research of current DoD studies and initiatives, and as a result of applying concepts learned from the Penn State University Best Practices Seminar phase of the ILC Initiative:

1. Change the paradigm of where inventory is located
2. Reduce the days of safety level and order ship time
3. Improve the information technology and business processes that effect the way materiel is processed throughout the Marine Corps.

The combinations of these three improvements are projected to draw-down selected inventories by a cumulative 45-60% ($549M-$706M) over a three-to-five year period. Following is the analysis pertaining to these three methods beginning with a discussion of the Marine Corps inventory profiled for this analysis.

Reducing the Inventory of Commonly Available Items

Inventory Profile Analyzed

The inventory analyzed for this business case is Marine Corps owned materiel, where the Marine Corps is the PICA (Primary Inventory Control Activity) and SICA (Secondary Inventory Control Activity). All classes of supply (see Figure A-3) were included with the exception of class V, VI, and Class VII. Class V materiel is ammunition that has its own appropriation and management process. Class VI materiel are Sundry and Personal Demand items such as alcohol, toilet paper, chewing gum, shaving cream, etc., that would have marginal improvements by these recommendations. Class VII materiel are assets, such as tanks, trucks, radios, etc., and are managed separately with its own appropriation process.

Classes of Supply	Description
Class I	Food / Water
Class II	Individual and Unit Issue
Class III	Petroleum, Oil and Lubricants
Class IV	Engineering & Construction
Class V	Ammunition
Class VI	Sundry / Personal Demand Items
Class VII	Principal End Items
Class VIII	Medical / Dental Supplies and Blood
Class IX	Repair Parts

Figure A-3: Marine Corps Classes of Supply

Total inventory data is not available using the current Marine Corps information systems. Partial inventory data exists only at the operating levels since total Marine Corps inventory has never been managed at the enterprise level. The ILC Business Case workgroup pursued many different avenues to determine overall inventory data. After two weeks of efforts it was determined that individual data calls would be made to specific operational levels to obtain subsets of the data needed. The ILC Business Case workgroup would then compute the total inventory for the selected classes and locations.

Data calls were made 18 Jan 1999 to all the SASSY Management Units (SMU) and the wholesale ICP-SSIR. The data was then analyzed and the ending FY 98 inventory was calculated at $1.2 billion with an associated annual budgeted expenditure of $346 million (see Figure A-4).

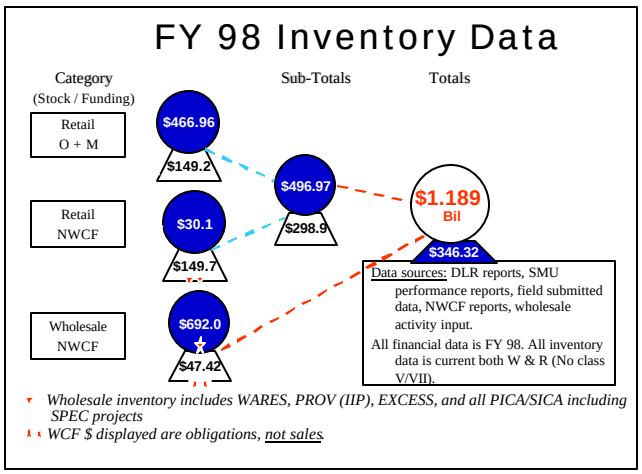

Figure A-4: Marine Corps FY 98 Inventory Data for Selected Classes of Supply

Categorizing FY 98 Inventory Profiled By Quadrant Element

Eliminating the need for the Marine Corps to own and store materials that are readily available from numerous vendors can potentially reduce Marine Corps inventory levels by $348M to $417M from the $1.189B baseline inventory analyzed.

The Quadrant Model (Figure A-5) is a major concept developed during the ILC Initiative and implies entirely new ways of managing materiel in the Marine Corps (more detail on the Quadrant Model is discussed in the Case Study). A major assumption of the Quadrant Model is for vendors to own and manage certain materiel that is available from multiple vendors. Owning, storing, and managing materiel such as office supplies, oil filters, and other low value materiel wastes Marine Corps capital resources and process time that could be more effectively be applied elsewhere. We used a two-step approach to analyze assumption one. Step one was to allocate the $1.189B inventory across the Quadrant Model. The second step was to determine the percentage ranges of inventory that will be owned by the Marine Corps and then calculate the dollar ranges of materiel that can be drawn down if no longer owned by the Marine Corps.

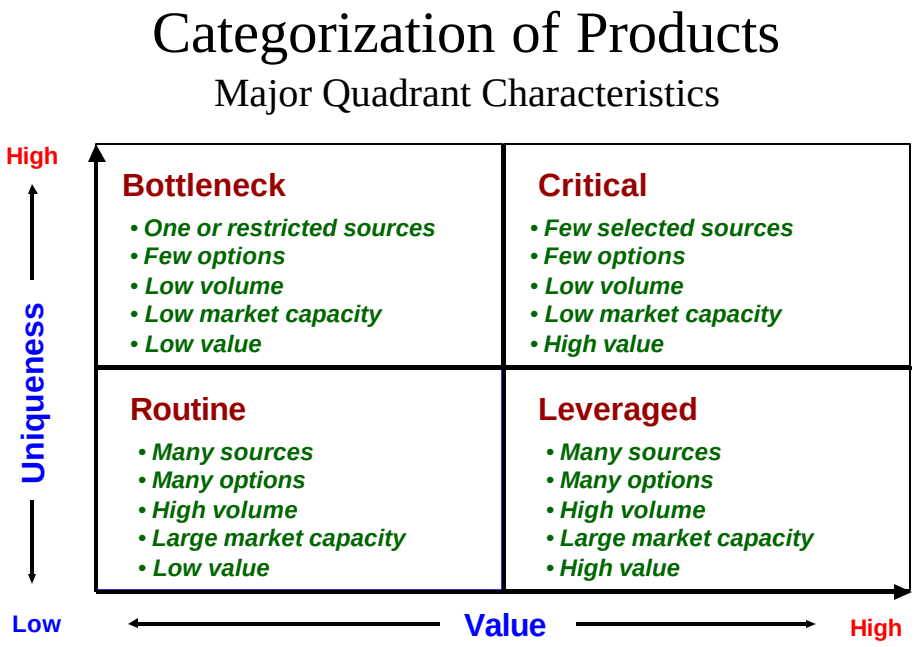

Figure A-5: Categorization of Product by Quadrant

Step 1. Allocate the 1.189 billion-dollar inventory across the Quadrant Model:
The ILC Team discussed how best to allocate the materiel across Quadrant Model. The group agreed that the following assumptions were logical based upon the collective experience of the individuals in the workgroup.

a) 90% of materiel costs are critical and leveraged, and critical materiel costs twice that of leveraged materiel
b) 90% of the remaining materiel is routine and less than 1 percent is bottleneck

The implications of the above assumptions in terms of materiel cost allocation across the Quadrant Model are represented in Figure A-6 below.

Assumptions	Materiel Costs Allocated Across Quadrant Model
a) 90% of materiel costs are critical and leveraged and critical materiel costs twice that of leveraged materiel	Critical = 60% of inventory Leveraged = 29% of inventory* Total Critical and Leveraged = 90% of Inventory ** For rounding purposed leveraged is calculated at 29%*
b) 90% of the remaining materiel is routine and less than 1 percent is bottleneck	Routine = 10% of inventory Bottleneck = 1% of inventory

Figure A-6: Implications of Inventory Assumptions

Categorization of FY 98 Inventory To Quadrant Model

In order to support the previous assumptions an ILC analysis of a representative MEF's materiel was conducted and is summarized in Figure A-7. The results are comparable to the previous assumptions. The assumption that 90% of materiel is critical and leveraged compares to 89% determined by the ILC Business Case Team analysis. The assumption that 10% of routine and bottleneck parts compares to 12% determined by the ILC Business Case Team analysis.

Since the Quadrant Model is a new approach, there was no simple way to analyze existing data based on current cataloging or usage practices to assign materiel to quadrants. We used a 1st FSSG "Risk versus General Account Balance File (GABF)" analysis conducted during the ILC Initiative, along with a 1998 3rd FSSG Pareto analysis of inventory by cost and usage of items. In each approach, we considered materiel Combat Essentiality Codes (CECs), usage, and cost in category "bands" within the quadrant. Both of these analyses validated our assumptions, and the results are summarized in the "ILC Analysis" column of Figure A-7 below.

Quadrant Elements	Assumptions of % Cost Allocation	ILC Analysis (%)
Column 1	*Column 2*	*Column 3*
Critical	60	70
Leveraged	29	16
Routine	10	8
Bottleneck	1	6
Totals	**100**	**100**

Figure A-7: Comparison of Materiel Analysis vs Quadrant Assumptions

Primary usage of materiel in the FMF is Class IX materiel so it is not unexpected that the analysis shows a higher percentage of critical materiel than used in the assumptions. As the percentage of critical materiel increases, the greater the anticipated inventory draw-down using the Quadrant Model principles. To be conservative the ILC Business Case workgroup decided to use the 60 percent assumption for critical materiel.

Interestingly, if our assumption that 60 to 70% of the cost of Marine Corps materiel requirements is Critical items, but that quantity turns out to be too high, that will mean that there is truly either more Leveraged or Routine materiel. If that is the case, it will yield further benefits, since it will allow us to draw-down inventories even further than our analysis currently estimates.

Figure A-8 below summarizes the analysis conducted using 1st FSSG's SMU inventory data and the ILC Team's assumptions on how to assign materiel to the quadrants.

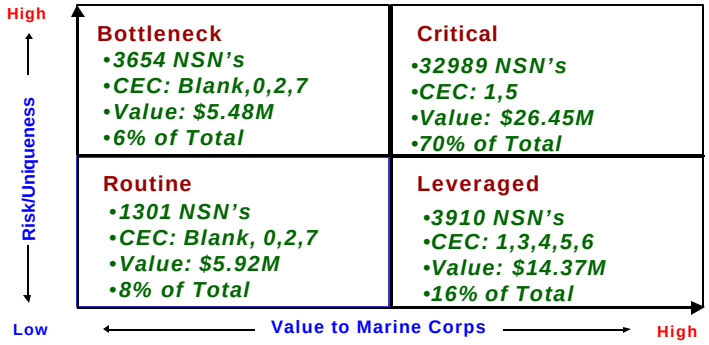

Figure A-8 Risk vs. Value Analysis of a MEF's General Accounting Balance File - Class IX

Using the assumption percentages in column 2 from Figure A-7, the $1.189B Marine Corps inventory was allocated to the quadrant elements and is shown in Figure A-9. The analysis continues with step two of the process.

Quadrant Elements	Assumptions of % Cost Allocation	Inventory Dollar *($millions)*
Column 1	*Column 2*	*Column 3*
Critical	60	713
Leveraged	29	345
Routine	10	119
Bottleneck	1	12
Totals	**100**	**1189**

Figure A-9: Marine Corps Materiel Dollars Allocated To Quadrant Elements

Quantifying Potential Material Reduction of Routine and Leveraged Materiel

a) Determine the percentage ranges of inventory that will be owned by the Marine Corps and,
b) Calculate the dollar ranges of materiel that can be drawn-down if no longer owned by the Marine Corps

The Quadrant Model implies that all routine and leveraged materiel is to be owned and stored by vendors. For this analysis the ILC Business Case workgroup agreed that a conservative approach that allows 10-25% of the routine and leveraged materiel to be owned and stored by the Marine Corps would be more prudent for the business case analysis. When this approach is applied $348M-$417M of the $1.189B Marine Corps inventory would be reduced, as seen in Figure A-10.

Quadrant Elements	Inventory Dollar *(millions)*	Dollar Effect of Vendors Owning 75% of Inventory *($millions)*	Dollar Effect of Vendors Owning 90% Inventory *($millions)*
Column 1	*Column 2*	*Column 3*	*Column 4*
Routine	119	89	107
Leveraged	345	259	310
Totals	**464**	**348**	**417**

Figure A-10: Inventory Savings Where Routine and Leveraged Parts Are Owned by Vendors

Reducing Annual Carrying Costs

Summary

Carrying costs represent the value associated with holding onto inventory. This includes space, manpower, equipment, etc. that is used to maintain the inventory on hand. Douglas Lambert's treatise on inventory carrying costs, acknowledged to be a standard used by industry today, concluded that carrying costs ranged from 14-35% of on-hand inventory[1]. It is general knowledge in the logistics community that 25 percent is a good average to use when computing carrying costs. The Business Case workgroup, as a result, agreed to use 15-25% as the range which resulted in a $125M estimated yearly reduction of carrying costs.

Quantifying the annual benefit of reduced carrying costs

Each of the three areas that will impact inventory has been calculated and represented in range reductions. The average of these reductions is used to apply the 15-25 percent carrying cost reduction. The ILC Business Case workgroup determined that using the average for each of the three ILC Initiative recommendations results in a more conservative approach. The specific steps used to compute the estimated yearly reduction of carrying costs is listed below and represented in Figure 11: Quantifying Carrying Cost Reductions.

1. List the FY 98 inventory profile by Quadrant element
2. Summarize the reductions from the three ILC Initiative inventory recommendations
3. Calculate the estimated ending inventory
4. Calculate the estimated carrying cost savings by multiplying the estimated ending inventory by 15-25 percent

[1] Douglas M. Lambert, *The Development of an Inventory Costing Methodology: A Study of Costs Associated with holding Inventory* (Chicago: National Council on Physical Distribution Management, 1975)

Allocation of FY 98 Inventory To Quadrant Elements		Average Reduction of Inventory Due to Future Ownership by Vendors	Average Reduction of Inventory Due to Changes in Requirements Determination	Average Reduction Due To IT and Business Process Improvements	Average Inventory After Deducting ILC Initiative Recommendations	Average Project Carrying Cost Savings @ 22.5% [Column (2-5)* 22.5%]
Column 1	*Column 2 ($millions)*	*Column 3 ($millions)*	*Column 4 ($millions)*	*Column 5 ($millions)*	*Column 6 ($millions)*	*Column 7 ($millions)*
Critical	713	0	n / a	53	n / a	n / a
Leveraged	345	285	n / a	4	n / a	n / a
Routine	119	98	n / a	1	n / a	n / a
Bottleneck	12	0	n / a	1	n / a	n / a
Totals	**1189[1]**	**383[2]**	**185[3]**	**61[4]**	**557**	**125**

Notes:

1. See Figure A-9: Marine Corps Materiel Dollars Allocated To Quadrant Elements
2. Average of Totals in Column 3 and Column 4 from Figure A-10: Inventory Savings Where Routine and Leveraged Parts Are Owned by Vendors
3. Average of Totals in Column 3 from Figure A-14: Calculating Dollar Benefit of Improved Requirements Determination
4. Average of Totals in Column 6 from Figure A-15: Calculating Inventory Reduction Savings for IT and Business Process Improvements

Figure A-11: Quantifying Carrying Cost Reductions

Modifying Requirements Determination

The area of requirements determination provides significant opportunity for the Marine Corps to draw-down inventory and avoid future costs for replenishing materiel. The ILC Business Case workgroup analyzed the FY 98 baseline inventory resulting in a projected 13-18% one-time inventory draw-down over a 2-5 year period. Corps wide, this draw-down represents roughly $160M-$209M of wholesale and retail inventory.

These numbers are validated by a September 1996 Navy Auditor General Report on Marine Corps Reparable Issue Points (RIPS), which suggests that changes to Requisitioning Objective (RO) computations in reparable items would result in a 50% inventory reduction, or annual savings between $103M to $233M for reparables. These savings would be achieved through phasing out excess stocks, making lateral re-distributions, and by correcting inaccurate computations in the information systems used to determine RO's.

Currently, Marine Corps policy sets some of the variables of Requisitioning Objective at fixed levels, which inflates total inventory stockage requirements. These levels were probably derived from mean order processing time, ship time, and other lead time variables in the days before robust inventory management AIS's, network communications, and deregulation of the transportation industry. Such lead times reflect the 1970's "please allow 6-8 weeks for delivery" mentality in distribution at that time. The commercial distribution environment today reflects a system measured by

hours or days, not by the days and weeks upon which our current Marine Corps inventory models and policies are built.

Business takes a probabilistic approach to these variables in order to optimize customer service levels, minimize risk of stock-outs, and invest effectively in stocks it carries. The business approach requires information systems which track lead time, usage, and demand data by stock keeping unit (SKU) so that inventory models can be applied to effective decision making and procurement[1].

Rightsizing the RO Stack

Requirements stack are those variables that determine how much of a particular item to provision and to have on-hand to meet demand, and that yield a quantity called Requisitioning Objective. At the retail level, it consists of three basic variables; Operating Level (OL), Order Ship Time (OST), and Safety Level (SL). At the wholesale ICPs, the terms Procurement Lead-Time (PLT) and Administrative Lead-Time (ALT) are comparable to the term OST at the retail level. At Reparable Issue Points, component failure rates and repair rates contribute to lead-time. Marine Corps policy currently fixes two of these three factors at set levels, which inflates our stockage requirements.

Operating Level (OL): Marine Corps policy currently sets OL at 60 days of supply. The rationale for the 60-day OL is presumably to meet our doctrinal stand-alone sustainment capability. We recommend challenging this assumption in today's distribution based supply chain environment, and basing OL on economic order quantity (per DoD instruction) and on vendor/supplier lead-time by NSN. A 50% reduction in the OL of certain common items is not unrealistic, while certain low rate production or long-lead time items may require higher operating levels. For purposes of this analysis operating levels have been left at 60 days.

Order Ship Time (OST): Currently set at 45 days in SASSY, this number is contributing to inflated inventory costs and excess requirements. Computing OST by item and using a confidence interval of OST distribution data would yield savings between 10-30 days of OST (for low usage items where insufficient statistical data would be available, OST averages by source of supply channel could be substituted). One day of retail OST is valued at $200K to $220K per day at our SMU's, therefore even incremental reductions in OST result in significant inventory savings.

1st FSSG has developed a local program which computes OST by NSN, and when fielded, ATLASS II+ will do this for the Marine Corps. 1st FSSG has found that by computing OST by NSN, 90% of the items coming from the two major Defense Logistics Agency (DLA) Depots have an OST between 18-40 days. One day of OST at 1st FSSG

[1] ATLASS II+ to be fielded during FY 00 is reported to compute OST by NSN, which will significantly improve the way RO is currently determined.

amounts to roughly $210K of inventory. Therefore, a five day reduction in OST (45 to 40 days) amounts to a $1M reduction in required inventory at one SMU.

Figure A-12 below graphically illustrates the approach to computing OST statistically instead of using a fixed 45-day level. The chart represents a typical demand profile for a theoretical NSN, having a mean OST of 15 days. A 90% customer service level of the demand would set OST at 30 days, a 15 day reduction from current policy. Such an approach to computing OST across the entire population of stocked items is estimated to reduce retail OST by at least 10-30 days.

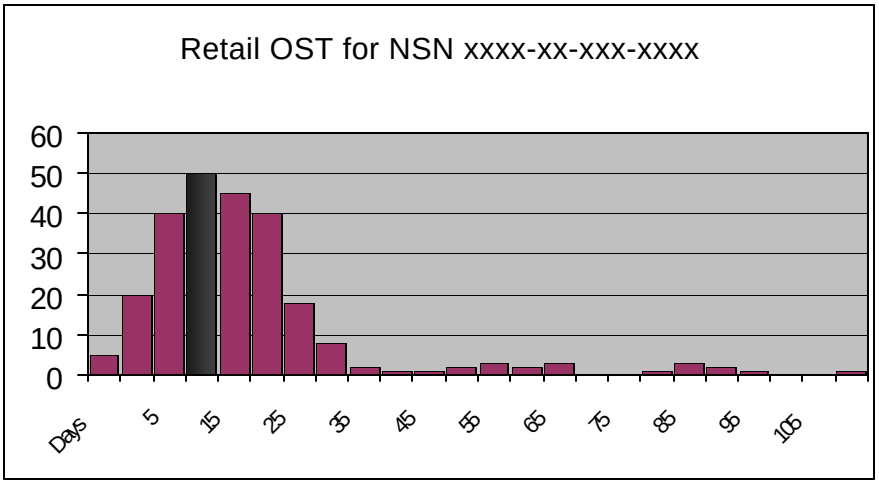

Figure A-12: OST Statistical Distribution

Safety Level: Safety level is currently set by Marine Corps policy as 30 days for critical items, and 15 days for routine items. According to DoD materiel policy and standard industry practices, safety level should be more appropriately determined as a function of the quantity needed to reduce the risk of stockouts due to fluctuation in demands, washout rates, OST and repair cycle time. As OL and OST are decreased, safety levels for most items should be appropriately adjusted, to reduce probability of stockout of critical items. Assuming that roughly 50% of an RO would be made up of safety stock[1], we would not necessarily experience any inventory reduction due to changed safety levels. Any required increases in safety levels would be offset by reductions in OST and OL, with the net being no change to the total requisitioning objective quantities.

a. *Data requirements.* In order to manage inventory effectively and economically, we must be able to collect and obtain data on variables affecting requirements stack. To do this, we will need to know demand by item, and be able to measure lead-time by NSN and source or supply over monthly, quarterly or annual usage periods. This will either require system modifications to SASSY for the short-term, or changes to ATLASS II+ Enhancement priorities.

[1] Navy Auditor General Report to CMC (RPR) of 13 Sep 96.

b. *Timeline.* For the purposes of this business case, we will assume that ATLASS II+ has developed the required data capture, or that ILC Initiative recommendations will influence the ATLASS II+ (enhancement) development, so that when completely fielded (FY 02), computation of RO's will reflect the new approach to requirements determination, and net investment cost is zero. Next, a statistically significant amount of demand data will have to be collected (six to twelve months) in order to determine the "new / improved" RO levels, followed by a one to three year inventory draw-down.

Summary of Requirements Stack

Figure A-13 summarizes the potential gains in rethinking the Marine Corps approach to requirements determination. Figure A-14 then applies the potential gains to the critical and bottleneck materiel of the Quadrant Model. This analysis does not apply to routine or leveraged materiel since the Marine Corps will only own 10-25% of the current FY 98 baseline inventory in future years.

Requirements Category	Current	2-5 Year Goal	% Reduction
Operating Level	60 Days	60 - 60 Days	No net change
OST*	45 Days	10 - 15 Days	33% - 66%
Safety Level	15-30 Days	15 - 30 Days	No net change
Total Effect on Requisitioning Objective	**120 – 135 Days**	**85 – 105 Days**	**22%[1] - 29%[2]**
Notes: 1. 120 days less 85 days = 35 days; 35 days / 120 days = 29% 2. 135 days less 105 days= 30 days; 30 days / 135 days = 22%			

Figure A-13: Calculating Percentage Reduction of Requirements Determination

*OST reductions are conservative based on an estimated distribution for the total population for the Marine Corps inventory. The estimated distribution is based on a FSMAO-2 Smart Initiative study of I MEF data for FY 96, and a 1997 Precision Logistics study by FSMAO III. The Marine Corps Precision Logistics goal is five days by 2005. Under the Quadrant Model approach to item stockage, OST for leveraged and routine items effectively goes to zero days, therefore the net effect on the total OST goal can reasonably be assumed five days.

Quadrant Elements	FY 98 Inventory Allocated by Quadrant Elements	Potential Reduction Due To Reduction of Requirements Determination (Column 2 *.22% / Column 2 * 29%)
Column 1	*Column2*	*Column 3*
Critical	713	157-206
Bottleneck	12	3-3
Totals	**725**	**160-209** [1]
Notes **1.** The effective percentage reduction from the FY 98 baseline inventory is 13%-18% (160 / 1189 and 209 / 1189)		

Figure A-14: Calculating Dollar Benefit of Improved Requirements Determination

Improving Business Processes and the Use of Information Technology as an Enabler

Study after study shows that information technology and effective improvements in business processes improve operational performance by orders of magnitude. At an annual logistics conference in 1991 Xerox reported that it was successful at reducing its inventory by over $700 million within two years by improving its logistics processes[1]. In a First Quarter 1996 report Booz, Allen, Hamilton reports that "…cycle time reductions of 70 percent, quality and service improvements of 100 percent and cost cutting of 50 percent or more…" are not uncommon. Investments in information technology pay off handsomely as well. In a 1998 worldwide IT benchmark study of more than 1,000 companies by Rubin Systems Inc., top performing companies can expect as much as a $1,000 improvement in revenue and $50-$100 in cost for every IT dollar invested.[2]

The ILC Business Case workgroup has taken a conservative approach in estimating inventory improvements due to IT investments and improvements to business processes. Reductions in inventory due to shorter safety stock and order ship times, discussed in an earlier section, could not be achieved without process improvements and IT investments. Additional reductions, however, could be achieved through more effective procurement processes, vendor relationships, and asset visibility. As a result, a conservative estimate of a 5-10% reduction of inventory is being estimated yielding an additional inventory reduction of $41M-%80M.

[1] "IT Dollars and Sense", *Information Week*, September 14, 1998.

[2] F. Matthew Stenross and Graham J. Sweet, "Implementing an Integrated Supply Chain," in *Annual Conference Proceedings*, 1991, Oak Brook, Ill.: Council of Logistics Management 1992, vol. 2, pp. 341-51).

Calculating the Estimated Inventory Reduction Due to Improvements in IT and Business Processes

To calculate the estimated inventory reduction the total inventory dollars allocated across the Quadrant Model was used as a base (see Figure A-9: Marine Corps Materiel Dollars Allocated To Quadrant Elements). Reductions were then made for the critical and leveraged inventory that would be reduced as a result of the Marine Corps not stocking these items in the future. These reductions were based upon the range of reductions and averaged for simplicity. A 5-10% estimated reduction for IT and business process improvements was then applied to the balance yielding the projected estimated reduction of $41M-$80M (see Figure A-15: Calculating Inventory Reduction Savings for IT and Business Process Improvements).

Allocation of FY 98 Inventory To Quadrant Elements			**Average Reduction of Inventory Due to Future Ownership by Vendors(1)**	**Balance of Inventory (2)**	**5%-10% Reduction Due To IT and Business Process Improvements**
Column 1	*Column 2*	*Column 3 ($millions)*	*Column 4 ($millions)*	*Column 5 ($millions)*	*Column 6 ($millions)*
Critical	60%	713	0	713	36-71
Leveraged	29%	345	259+310 / 2= 285	60	3-6
Routine	10%	119	89+107 / 2 = 98	21	1-2
Bottleneck	1%	12	0	12	1-1
Totals	**100%**	**1189**	**383**	**806**	**41-80**

Notes

1. See Columns 3 and 4 from Figure A-10: Inventory Savings Where Routine and Leveraged Parts Are Owned by Vendors
2. Column 4 less Column 3

Figure A-15: Calculating Inventory Reduction Savings for IT and Business Process Improvements

Advantages of Moving 2nd Echelon Maintenance to the Intermediate Level and 4th Echelon Maintenance to the Depot Level

The transfer of responsibility for 2nd echelon maintenance to the Intermediate level, and 4th echelon maintenance to the Depot level will have several quantifiable and non-quantifiable benefits to effectiveness of logistics support to the customer, and efficiency to the support of the Marine Corps.

The Commander of a MEF or subordinate MAGTF does not have one entity to hold accountable for materiel readiness. He can hold the Ground Combat Element (GCE) Commander, typically the Division Commanding General (CG), accountable for ground combat issues, and the Air Combat Element (ACE) Commander accountable for the aviation issues, but no one single person is accountable for materiel readiness because the accountability is fragmented throughout the organization. The largest portion is held by the numerous battalion commanders throughout the MEF doing 2nd echelon repair. All involved entities blame each other when materiel readiness issues arise.

The effectiveness of the maintenance support provided to the warfighter can be increased in several principal ways:

- Consolidate 2nd and 3rd echelon maintenance
- Establish a robust customer support function in the FSSG
- Free warfighters to focus on core competencies
- Increase tooth / tail ratio
- Single process owner for materiel readiness

First, the current process introduces functional layering delays in the maintenance process that tend to increase the repair cycle time. By performing 2nd and 3rd echelon maintenance at the same location, many of the now sequential processes can occur in parallel, allowing the total time of repair to be reduced, even though the total workload remains constant. The establishment of a robust customer support function that will allow the customer to work with the same team of logisticians develops trust and confidence in the logistics process. This transfer allows the Using Units to spend time in the area of their core competency, “shoot, move, communicate”, instead of focusing on repairing equipment or obtaining supplies. By moving the maintenance and supply personnel to the Intermediate level, the mobility, deployability and the tooth / tail ratio of that organizational unit improves. Ultimately, the Commander of the CSSE would be responsible for materiel readiness to the MAGTF or MEF Commander.

In addition to providing more effective support, the future model for maintenance will improve the efficiency of the Marine Corps. There are currently several hundred "Mom and Pop" maintenance shops that each have overhead in terms of personnel, tools and test equipment, publications, and footprint. Processes that are currently duplicated at the 2nd and 3rd echelons would be combined, eliminating redundant induction and QC

inspections, and MIMMS/SASSY validation and reconciliation. The volume of supply transactions and transportation transactions will also be reduced, streamlining the order, shipping, and receiving process for repair parts.

Improved Effectiveness

Reduction of Repair Cycle Time (RCT)

By current maintenance policy, all 2nd echelon maintenance must be completed or all parts must be ordered before a piece of equipment is evacuated to the Intermediate level for 3rd echelon maintenance. The equipment undergoes a redundant series of inspections between organizational and intermediate maintenance shops. Parts are ordered by both the 2nd and 3rd echelon maintenance personnel, increasing the amount of overhead transactions, transportation overhead, and order ship time. Finally, because the work takes place in a serial path, the overall time of completion depends on the additive elapsed time at each echelon.

Performance of 2nd and 3rd echelon maintenance by the same personnel will eliminate many of these duplicative processes, and will allow 2nd and 3rd echelon work to proceed in a parallel vice series flow. An analysis was done of 563 outstanding Equipment Repair Orders (EROs) on HMMWV that required evacuation from 2nd to 3rd echelon in a MEF, a high density end-item in the MEF that provides a good representative case example.

The analysis was done with the use of the Materiel Readiness Information System (MRIS), a system that "web enables" MIMMS and SASSY Information. Specific questions about Intermediate level Maintenance were answered by the Company Commander at Motor Transportation Maintenance Company (MTMCO), 1st Maintenance Battalion, 1st FSSG. Additionally, the personal experience as Maintenance Officers of ILC Business Case Team personnel was used to address Organizational Level Questions.

Analysis of this data showed that the average ERO was open for 42 days at 2nd echelon and 15 days at the 3rd echelon. By eliminating the redundant processes of inspections, recovery and transportation, and assuming concurrent vice serial ordering of parts and repair of the vehicle, fifteen days can be eliminated from the repair process:

- Two days are saved by eliminating the redundant aspects of recovery and transportation to and from the repair facility, as this only needs to happen twice, as opposed to four times (i.e. End User -> 'O' Level Shop; 'O' Level Shop -> 'I' Level Shop; 'I' Level Shop -> 'O' Level Shop; 'O' Level Shop -> End User).
- Two additional days are saved by the elimination of the redundant induction and QC inspections and associated delays as the vehicle awaits inspection.

- Performance of the materiel ordering and repair processes together vice separate and sequential results in an eleven-day reduction in total time.

As a result of eliminating these redundant processes and performing the order and repair processes in parallel, the organizational unit can have its asset back in 27 days, vice 42 days (see Figure A-16). This represents a 35% reduction in RCT. In addition to better supporting the customer, the ability to restore equipment to operational status faster than before will result in improved readiness.

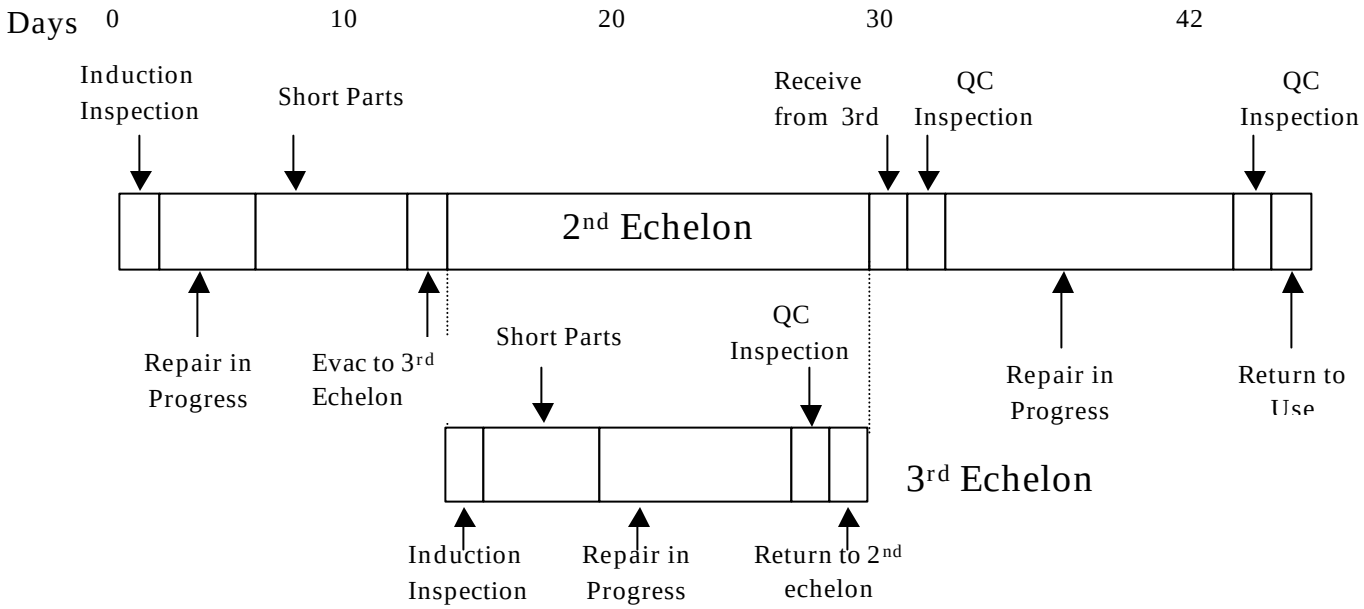

Figure A-16: Current Timeline for 2nd / 3rd Echelon Maintenance Process

Additionally, this reduction in RCT can have an additive effect on the inventory redistribution discussed earlier. If the repair part is a SECREP, reduction of the RCT means that fixed reparables are available sooner, which lowers the effective OST and stockage determination for that item. A qualitative savings of Marine Corps capital is realized. This effectively lowers the amount of inventory required to be maintained in order to provide a similar level of supply support. This effect was not considered in the previous discussion of inventory reduction. Additionally, this analysis conservatively assumed there would be no reduction in OST that is expected from other process improvements that the ILC Initiative could make. Decreasing the OST for these repair parts drops the RCT even further.

In summary, the separation of 2nd and 3rd echelon maintenance prevents materiel readiness single process ownership, causes multiple redundant work processes and places the ordering of parts and subsequent repair at both echelons in a serial critical path. Elimination of this redundancy will have a substantial impact in returning

equipment to the warfighter faster with higher quality repairs and less capital investment.

Robust Customer Support

Part of the process of transferring responsibility of echelons of maintenance would be the establishment of a Materiel Readiness Liaison Team (MRLN) team in each organizational unit. This support team is similar in concept to the Artillery Liaison Team currently working with the S-3 Section for fire support. This core team of five to six personnel would be co-located with the regiment or separate battalion S-4 they support, and would give the Regimental Commander one team of personnel responsible for materiel readiness of the unit. Since the team would operate with the regiment in garrison and deployed operations, a personal working relationship will already have been developed, which will increase effectiveness.

The MRLN team would pass the request for service back to a robust customer service center, staffed by personnel specializing in the six functional areas of Combat Systems Support: supply, maintenance, transportation, engineering, health services, and services. This cross-functional team would work together to coordinate the logistics functions to support the organizational unit. In the case of maintenance, the customer service center would dispatch a maintenance contact team from either Maintenance Battalion or a Mobile Combat Service Support Detachment (MCSSD), or retrieve the vehicle for repair elsewhere.

This robust customer service will increase effectiveness to the warfighter, as logistics personnel will be mission organized to provide robust, complete and efficient logistics support to the customer.

Refocusing of Effort on Core Competencies

Shifting responsibility for the performance of 2nd and 4th echelon maintenance will focus each organization on their core competency. Movement of 2nd echelon maintenance from warfighters whose core competencies are “shoot, move, communicate”, to the Intermediate level whose core competency is “ordering supplies and repairing items”, better focuses these competencies. Also, 4th echelon maintenance (overhauling of SECREPs) would be most efficiently done by the Depot level. The Depot already performs 5th echelon, overhauling of end-items. Shifting the responsibility to those personnel makes economic, functional and effectiveness sense.

A large portion of the personnel who currently perform organizational level maintenance would move to the Intermediate level, retained as part of the MRLN team, while others will be restructured back into operating forces. The graphs in Figures A-17 and A-18 clearly show the effect of reducing the amount of personnel serving outside the core competency of the operational unit.

Improved Efficiency

Reduction of Overhead in "Mom and Pop" Shops

Within a representative MEF, there are currently 168 commodity shops performing organizational level maintenance. Every one of these shops has an overhead associated in terms of personnel, tools, test equipment and technical manuals. For example, each shop has a shop chief, a layette clerk, a tool room clerk, a pubs clerk, etc. The tool overhead costs quickly become staggering. Each infantry battalion has $660,000 worth of tools, totaling in excess of $60,000,000 for the MARDIV alone. Organizational level technical manuals in the MEF total over 500 cu. ft. or 71 tons (which translates to five C-141's).

Eliminating the redundancies by shifting the responsibility for 2nd echelon maintenance will eliminate this overhead and result in very significant savings in terms of personnel, monetary investments in tools and test equipment, and footprint of tools and test equipment. Analysis of T/O billets at a MEF resulted in 3205 personnel involved in 'O' Level maintenance. An analysis by the ILC Business Case Team determined the makeup of the MRLN teams and increased MCSSD capacity required to support the additional responsibility for 2nd echelon maintenance, broken out by T/O billet. The results of this study concluded that 2564 T/O billets would be required, allowing 641 T/O billets to be reinvested back where they can best be used.

A similar analysis was performed for Supply T/O billets currently structured at the organizational level, revealing that there are 1269 billets. An analysis by the ILC Business Case Team revealed that there are remaining supply level functions at the organizational level that could not be transferred back to the Intermediate level. By leveraging an improved IT system as an enabler, and the reduction in Class IX Materiel required by the shift of responsibility, the study conservatively estimates that 1011 T/O billets would be required. These billets would be split among the organizational units, the MRLN Teams and the robust customer support center, while allowing 258 T/O billets to be reinvested back to the operating forces. The effects of the reinvesting can be seen in Figures A-17 and A-18.

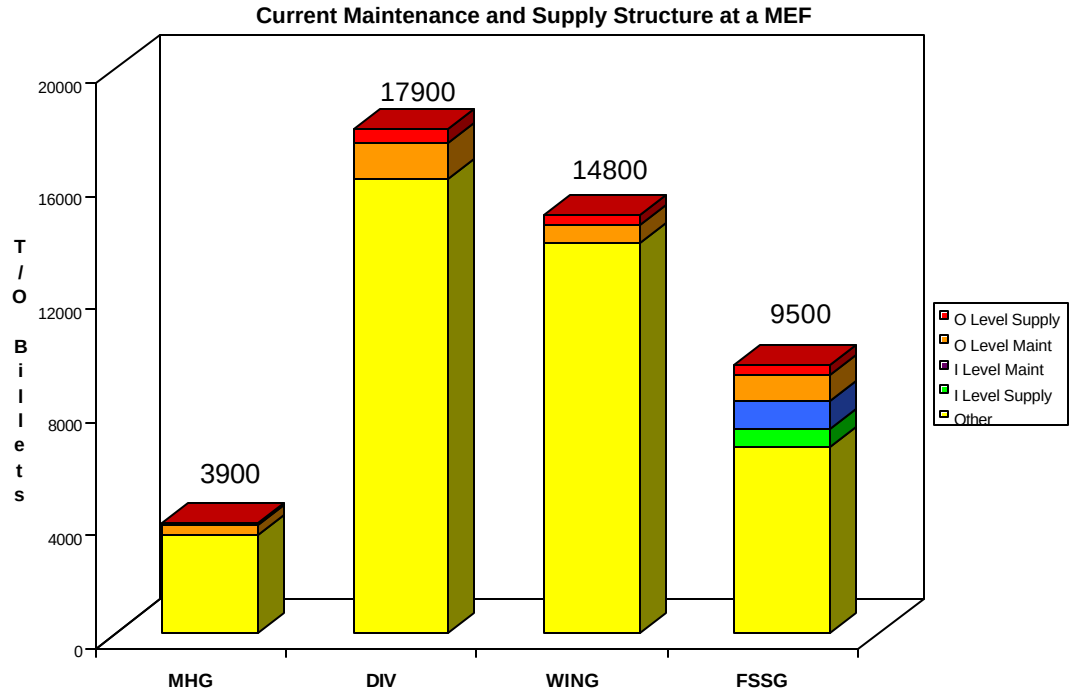

Figure A-17: Current State Structure

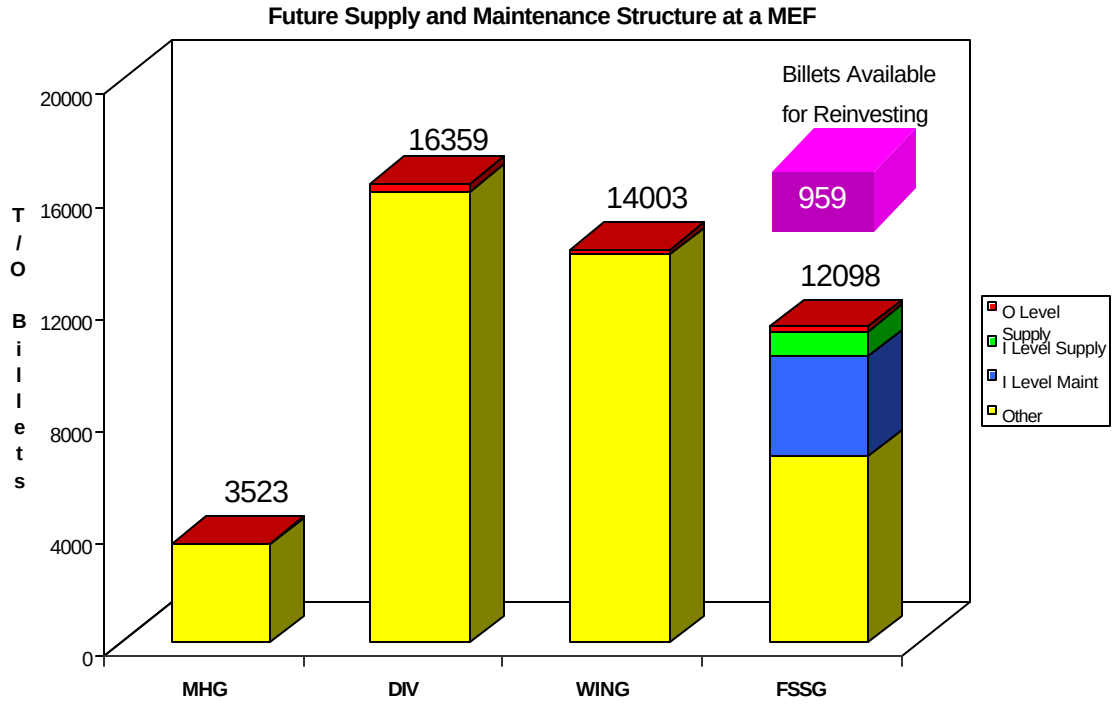

Figure A-18: Future State Structure

Costs Associated With Personnel Performing Maintenance

As responsibility for 2nd and 4th echelon maintenance is shifted to the Intermediate and Depot level respectively, 2589 T/O billets will be available for restructuring. While the costs of these personnel will not be a cost avoidance to the Marine Corps, it represents a reduction in the cost to the Marine Corps to accomplish maintenance.

Supporting Data

	Current	Future	Savings
Maintainers in a MEF	4210	4569	Structure = 641
Average labor rate/year	$36K	$36K	
Labor cost to a MEF/year of maintenance	$151.56M	$128.48M	$23.08
Derived labor cost for I, II, and III MEF/year of maintenance	$409.21M	$346.90M	$62.31M

Figure A-19: Layered Maintenance and Supply Personnel Savings

Increased Quality and Efficiency of Maintenance

In addition to the effectiveness and efficiency gained by the shift of the 2nd and 4th echelons, higher quality work is also expected to result from the shift. Junior maintenance personnel at the organization level will receive better OJT from the experienced personnel currently at the Intermediate level. The greater breadth and depth of repairs will add to the OJT.

Additionally, this distribution of personnel allows for more effective resource allocation and more flexible response to the priorities of the customers. For example,

Elimination of Redundant Processes

Elimination of Redundant Reconciliations

By current supply and maintenance policy, one supply and one maintenance person review every ERO each week that the ERO remains open. This reconciliation is done to verify that the parts are still required, the ERO is still open, to confirm which parts have been received or backordered. Since parts are currently being ordered at both locations, duplicative reconciliations for the same ERO are being required. Further, the fact that the 2nd echelon parts were ordered prior to being evacuated to the 3rd echelon requires that reconciliations of these parts occurs even though the equipment is unavailable for 2nd echelon work.

By shifting the 2nd echelon of maintenance to the Intermediate level, the duplicative reconciliations can be eliminated. Since the parts for both the 2nd and 3rd echelon maintenance will now be on one EROSL, the duplicative reconciliation will be avoided. A discussion of these savings follows:

Supporting Data

1 month of HMMWV @ a MEF

- 120 "I" ERO's / month @ 15 day ERO open time
- 563 "O" ERO's / month @ 42 day ERO open time

	Current	Future	Savings
Manhours / month to reconcile "O" ERO's	563	0	
Cost	$14.48K	0	
Manhours / year to reconcile "O" ERO's	6756	0	
Cost	$173.73K	0	
Manhours / month to reconcile "I" ERO's	40	563	
Cost	$1.03K	$14.48K	
Manhours / year to reconcile "I" ERO's	480	6756	
Cost	$12.39K	$173.23K	
Total savings @ a MEF			**$13.37K/year**
Total savings @ I, II, and III MEF			**$36.1K/year**

Figure A-20: Redundant Reconciliation Savings

This result considers only the gains that could be achieved on ERO's involving D1158 HMMWV's. The Marine Corps-wide number of ERO's compared to D1158 ERO's would make this number significantly greater ($500K-$1000K year).

Footprint/Deployability

Background

A further opportunity area for the ILC Business Case is in MARFOR deployment "footprint" and deployability include benefits through changes to a distribution based logistics support concept, managing inventory using the Quadrant Model approach, and moving selected intermediate echelon maintenance activities for secondary reparables to depot maintenance. The benefits of ILC Initiative implementation actions translate to a smaller deployment footprint, making a more responsive and lucrative force-of-choice for the supported CINCs.

Some of the areas addressed in the ILC Initiative are conceptual, therefore there was no detailed data or time available to support definitive, quantifiable benefits. However, there are clear opportunity areas from which we can draw reasonable planning assumptions and provide order-of-magnitude estimates of potential benefits. These opportunity areas include:

- Force Held Inventory reductions
- War Reserve Materiel Requirements reductions
- Force Structure Deployment reductions

The sustainment calculations used today for building operational deployment blocks and WRMR plans are based on 30 or 60 day self-sustainment capability for MAGTFs. We compute sustainment amounts in order to register lift requirements with a supported CINC so sufficient lift gets allocated to a MARFOR. However, our sustainment requirements may be inflated to the point where we are either sacrificing warfighting capability for duplicative sustainment or making ourselves appear too heavy to be a force-of-choice to a CINC.

Not since the battle of Guadalcanal in WWII has a Marine Corps fighting force been isolated from a sustainment base or distribution channel for thirty or more consecutive days. History will not let us repeat that lesson. Therefore, it is time to challenge our "iron mountain" approach to sustainment and accompanying supplies, using instead a distribution based approach to sustainment and mobility. Further, history shows that of the supplies we deploy with, between 20-50% of these never get used, and therefore the "right stuff" needs to be requisitioned and distributed through channel pipelines anyway[1].

[1] See Eccles, "Logistics In the National Defense," and Peppers "History of Military Logistics from 1939 to 1980."

1. Inventory Reductions.

Based on inventory reductions discussed in the section *Reducing Inventory of Commonly Available Items*, and changes to initial provisioning concepts, marginal changes in footprint can be realized. A reasonable estimate is a reduction of 20-50% of the deployment footprint for Classes II, IV, VI and IX, which comprise roughly thirty percent of a total force's lift requirements. Such reductions in requirements for accompanying supplies and sustainment translate to more lift available in the early phases of deployment for more forces. Any offsets in Operating Level stock reductions must assume a greater reliance on dependable transportation and distribution channels for effective combat support.

2. War Reserve Materiel Requirements.

Rough Order of Magnitude Estimate: Up to 70% Reduction.

This area provides *significant* opportunities for process improvement which yield benefits in terms of shifting the distribution of sustainment ratios to warfighting capability. Reductions are achievable in three ways:

- Refining computer algorithms and improving source data quality (Goal: 20-50% reduction from total lift requirement)
- Reduction of carrying levels of routine and leveraged items (Goal: 5 -10% reduction from total lift requirement)
- Realignment of maintenance echelons (Goal: 1 to 5% reduction from total lift requirement)

Currently, the War Reserve System (WRS) calculates WRMR for all logistics classes except ammunition (Class V). By attacking the "Science of Logistics" variables that determine our sustainment requirements, we can reasonably expect a 20-50% reduction in the footprint of our sustainment requirements. These can be achieved by updating source data used in computations, phasing consumption, and revising sustainment algorithms in WRS.

The models and calculations in WRS are based on out-of-date Combat Action Replacement Factors (CARFs), inaccurate Logistics Factors File (LFF) data, inaccurate TUCHA/TUDET files, and variability in peacetime consumption. Several classes of supply are based on the past twelve months of peacetime usage in CONUS, and may not accurately reflect wartime usage in a particular foreign geographic area. Management of this data has been institutionally ignored by the Marine Corps for the past several years, however our strategic mobility requirements and registered War Reserve withdrawal lift and budget computations are derived from this data. Further, the WRS sustainment algorithms do not account for the fact that forces are phased into

an area over time, and therefore consumption of sustainment would occur gradually and could be better phased with the flow of forces.

The ILC Business Case Team did a high level analysis of a Notional MEF sized force based on September 1998 MDL data in MAGTFII, and a February 98 War Reserve draw-down report using data from the FY 98 WRS Recomputation. (ILC Initiative analysis also highlighted a systems requirement for better integration of MAGTFII / JFRGII and the WRS). For illustration purposes, consider the relative sizes of forces to the sizes of a sixty day sustainment block for non-fuel, ammo and PEI type items:

Figure A-21 below is the size of a force in short-tons:

	pax	stons
CE	881	2,563
GCE	25,800	32,650
ACE	23,042	24,794
CSSE	7,707	21,150
Sust	0	15.295
Total	**57,430**	**81,172**

Figure A-21: Notional MEF Deployment Footprint in Short-Tons (STONs)

Figure A-22 below is the size of 60 days of sustainment for a comparable force listed above. Note that the "footprint" for organizational supplies (Class II) and for lumber and barrier materials (Class IV) are each larger than the entire MEF's strategic lift requirements. Our registered lift requirements reflect the need for moving such follow-on sustainment in the first sixty days.

Supply Class	stons
I	45,455
II	88,265
IIIp	1,147
IV	92,736
IX	4,189
Total	231,792

Figure A-22: 60 Day War Reserve Materiel Requirements in Short-Tons

Clearly, there are opportunities for improvement in the way we calculate our sustainment requirements alone. Because of the disproportionate size of the

sustainment requirements, there is a definitive need to suspect the assumptions, sustainment algorithms, source reference data quality, and dimensional data (shipping characteristics) used for generating total lift. A 50% reduction in sustainment for the classes listed still yields a sustainment footprint larger than that of the entire MEF's.

3. Forces: Realignment of Organizational Maintenance.

Further analysis is required in this area, however at a high level review, marginal reductions are achievable. These reductions are derived from redundant tools, publications, test and support equipment that would not have to be deployed when consolidating organizational maintenance at the Intermediate level. This assumes that most of the tools and support equipment are realigned to the CSSE, but that duplicate overhead is eliminated. At a high level analysis, the estimated net offset is estimated between 2000 to 5000 short-tons of cargo, and up to 959 passengers for a MEF sized scenario.

Provisioning

An ILC Initiative opportunity area that was examined at a high level was Initial Provisioning. At an "enterprise level" view of Marine Corps practices, there are potential gains from closely examining and revising our Initial Issue Provisioning practices. Ideally, we should strive to have vendors assume the risk and provide spares for the initial "infant mortality" phase of an equipment's lifecycle, and help develop "true" usage data for demand-based requisitioning objectives. After sufficient usage data on fielded equipment is captured, the Marine Corps should then buy an appropriate level of spares as lifecycle production rates demand. We recommend this as a target area for the newly established PM/WSEM teams at MARCORMATCOM.

Impact: Because of disconnected provisioning and stockage practices, we may be disposing of over half (and up to 90%) of our initial spares investments within the first three to four years of an item's life cycle, then reprocuring those same items later as end-items enter the "wear-out" phase. The dollar impact is between $12M and $30M annually (in PMC dollars).

Situation. Budget data suggests that we are currently spending more than what actual usage requirements are, disposing of "excess allowances" in the first three years, then reprocuring repair parts later in an item's life cycle when non-IIP parts begin to fail.

Background. Provisioning allowances for spare parts and reparables are to support newly fielded equipment until usage history is sufficient to generate a demand-based requisitioning objective for an item. Provisioning allowances provide a protected, "minimum" stock level for an initial two year demand period. If insufficient usage has been generated to develop a demand-based requisitioning objective at the end of two years, Marine Corps policy provides that the protection may be extended for one additional year.

Consider a typical lifecycle system profile of failure probabilities, traditionally called a "Bathtub Curve" in Figure A-23 below. We are most likely buying provisioning packages recommended by the vendor (in the LSAR) to cover estimated failure rates at levels during the initial lifecycle of equipment, when infant mortality is high.

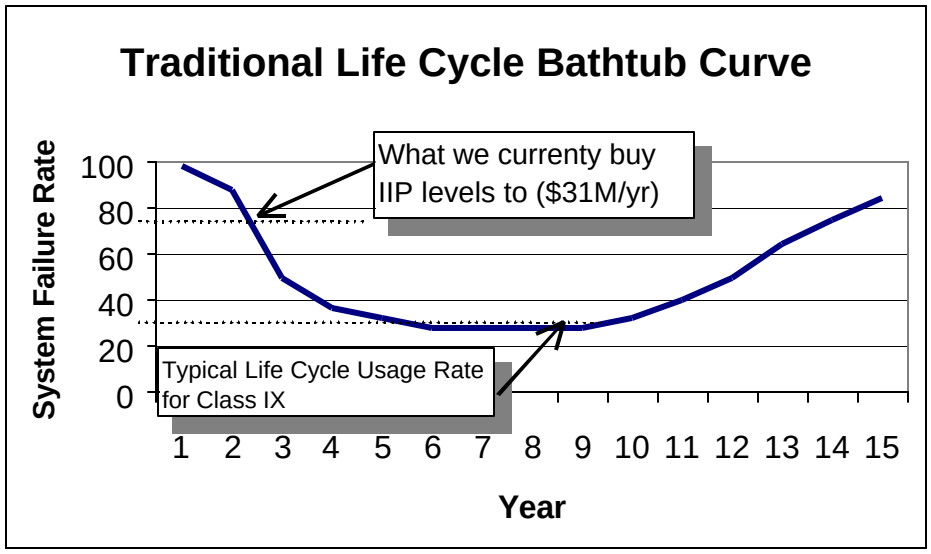

Figure A-23: Typical Lifecycle System Profile of Failure Probabilities

For the FY 99 budget, the Marine Corps plans to provision $31.6M of initial spares, and with transportation costs, this amounts to 7 percent of the total procurement outlay ($473M) for new equipment (PMC $). We do not have historical data on past IIP packages against actual usage data, since our systems are not geared towards tracking that data by specific end-item. However, according to a September 1996 Auditor General of the Navy Report to CMC (RFR), they found that between 40-90% of the "protected stocks" at our Reparable Issue Points did not have sufficient usage to warrant stockage, and were deemed "invalid" requirements. The obvious point here is that the initial provisioning packages were probably procured at levels shown in the upper line on the curve shown in Figure A-23, and for items that do not fail in the first three years of an item's lifecycle.

Another contributing factor to this problem may be that the equipment was fielded over a two to three year period, so that during that time, minimal usage data would have been generated to warrant demand-based stockage requirements. It is clear that our current provisioning practices warrant review and revision. If we are buying approximately $31M of initial spares annually, a 40% to 90% "excess factor" translates to $12M to $28M of unnecessary investments. If we could convince our vendors to be responsible for repair parts during the first phase of an equipment life cycle, the Marine Corps could reduce initial lifecycle investments.

Interestingly, in FY 98 the Marine Corps ICPs disposed of $115M worth of materiel. There may not be a direct correlation between IIP and disposal actions. There was not time to determine how much or if any disposals included "excess spares" provisioning stocks, however because of the scale of the dollar values it supports the benefit of examining provisioning practices with more scrutiny.

INVESTMENT REQUIRED TO ACHIEVE DESIRED BENEFITS

Investments will have to be made to achieve the full benefits of the ILC Initiative recommendations. The magnitude of these investments is estimated in the range of tens of millions of dollars for information systems, hardware and software, process improvements, organization restructuring, and skills development and enhancement. The ILC Team estimated the total program investment range between $150M-$200M over five years based upon industry examples. FY 99 and FY 00 investments were estimated at $21M-$29M and were based upon more detailed analysis, since this timeframe represents the foundation costs required to ensure a successful ILC implementation.

Industry Parallels

Industry has invested millions of dollars to achieve improvements in operational performance. Some of these programs succeed while others fail. An industry example of a successful transformation that parallels the requirements for the Marine Corps is IBM. Just a few years ago IBM was struggling and industry observers were forecasting its demise. IBM was organized in functional silos, ignored what other industry leaders were doing, and did not take a hard look at what was needed to succeed. Like the ILC Initiative, IBM looked at the marketplace as a battlefield and developed a battle plan to ensure success. IBM decided to look holistically at itself and develop an integrated program across the organization. Over a five year period it invested $20B and improved its operational performance by $100B, a 4:1 return on its investment.

ILC Mid-Term Estimate

The ILC Business Case workgroup used the IBM operational improvement ratio to estimate the investment required to achieve its project's $704M-$923M projected five-year return. By dividing this estimated projected return by four (the same ratio derived from IBM's success), a projected investment of $150M-$200M would be required.

ILC Near-Term Estimate

For FY 99 and FY 00, a more detailed analysis was conducted to develop the $21M-$29M estimate. These years represent the foundation investments to ensure a successful ILC implementation. The four major investment areas the ILC Business Case workgroup recommended are: information technology ($16M-$20M); evaluating disjointed logistics applications systems ($2M-$3M); hardware ($1M-$2M); and process improvements, vendor strategies, organizational re-structuring, roles and responsibility development, and skills development and enhancement ($2M-$3M).

Information technology costs were based on comparing the level of effort and investment for recently developed systems, and then by estimates applying the relative

proportional complexity and effort required to simulate the ILC Initiative requirements. ATLASS and MCDSS are two programs that the workgroup determined were comparable levels of effort and approximately three of these systems would be required. At an approximate cost of $6M the workgroup used a multiplier of three to project estimated information technology costs of $16M-$20M.

Approximately 140 logistics systems exist today. The ILC Team developed a System Realignment and Consolidation (SRAC) program to evaluate these systems. The workgroup estimated these investment costs at $2M-$3M.

Process improvements will have to be made to operationalize the ILC Initiative recommendations. How material is purchased and stored, based upon the Quadrant Model, has enormous implications to the way the Marine Corps does business today. New vendor strategies will have to be developed and implemented. The procurement process will have to be re-engineered along with other processes. As a result of process changes, organizational structure as well as roles and responsibilities of personnel will have to be evaluated, skill gaps measured, and training and development programs initiated. The ILC Business Case workgroup estimated that three ILC Initiative projects would be required to develop the process changes and were the basis for the $2M-$3M estimate.